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ABSTRACT

We describe a large-scale urban school initiative aimed at teachers' professional development with the goal of increasing teachers' mathematics content knowledge and helping them improve their practice. Believing that the formation of professional communities of teachers is crucial in supporting teachers trying to implement changes in their practice, the initiative provided opportunities for the formation of site-based supportive communities. Professional communities developed at some sites and not at others. We describe the factors, institutional and individual, in the formation of teachers' professional communities. (Author)

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WHAT FACTORS INFLUENCE THE FORMATION OF TEACHERS' PROFESSIONAL COMMUNITIES AND WHY SHOULD WE CARE?

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We describe a large-scale urban school initiative aimed at teachers' professional development with the goal of increasing teachers' mathematics content knowledge and helping them improve their practice. Believing that the formation of professional communities of teachers is crucial in supporting teachers trying to implement changes in their practice, the initiative provided opportunities for the formation of site-based supportive communities. Professional communities developed at some sites and not at others. We describe the factors, institutional and individual, in the formation of teachers' professional communities.

The administration and teachers working in a large urban school district in the United States have embarked on a massive reform of mathematics instruction in the district's schools. This reform includes extensive professional development from a local university. The coursework, site-based support, and daily shared professional development time is intended to facilitate teachers' sustained growth in content knowledge and practice. Somewhat serendipitously, this reform effort has offered extensive opportunities for research on teacher change. One aspect of our research, which we report on here, focused on the nature of the site-based communities in which these teachers participate. What aspects of these teachers' professional lives influenced the development and nature of these professional communities?

THEORETICAL PERSPECTIVE

We see this question as important because we adopt an interpretive approach that views the practices of the teachers as situated within their professional communities and in the schools and school district in which they work. In adopting the situative perspective, we focus on the reflexive nature of the settings of teacher learning and teachers' different kinds of knowing (Cobb & McClain, 2001; Putnam & Borko, 2000). Our working hypothesis is that teachers' practices develop within a community and that local contexts can play a crucial role in teachers' beliefs, knowledge, and conceptions of effective pedagogy (cf. Franke & Kazemi, 2001; Kyriakides, 1998; McLaughlin & Talbert, 2001). We see the development of a teacher's identity as a mathematics teacher as situated within communities. Other studies (Adler, 1996; DeFranco & McGirney-Burelle, 2001; Talbert & Perry, 1994) suggest that departmental and school-based communities in which teachers participated were a fundamental part of their development of identity as teachers of mathematics. Franke & Kazemi (2001) suggest that the existence of a professional

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community may be even more critical in supporting experienced teachers learning to teach in new ways.

THE SETTING

Our study took place in a large urban school district. The superintendent had developed a broad-based plan to increase student learning in literacy and mathematics, and had in fact been able to obtain large amounts of funding from private agencies to carry out this unique plan. One component of the plan was to assure that all students in grades four through six were taught mathematics by teachers prepared to do so. To begin this work, the eight lowest performing schools in the district were allowed to hire 32 additional teachers to their staffs, with the understanding that these teachers would teach only mathematics (three classes each 90 minutes long), that they would have 60-90 minutes each day together for professional development time, and that they would take university coursework that would help them obtain a deeper understanding and ability to teach appropriate mathematics. For the most part, teachers who sought out these positions did so because they enjoyed teaching mathematics. All teachers were experienced; about half were bilingual in Spanish and had a credential for teaching bilingual children.

The university mathematics specialist professional development program for the teachers consisted of 12 semester hours of coursework designed specifically for the needs of the teachers. The 6 semester hours of mathematics were taught by experienced instructors with master's degrees in mathematics and familiarity with the elementary school mathematics. The 6 hours of mathematical pedagogy courses were taught by two teachers-in-residence (TnR) who were master teachers from the school district with prior experience in high-poverty culturally diverse schools and prior experience as providers of professional development. The pedagogy courses focused on children's thinking about mathematics, teaching second language students, curriculum implementation, and pedagogy.

As a result of their extensive coursework as a cohort, we would expect these teachers to have theoretically shared patterns of discourse developed over time. This 'community of discourse' would have been further supported by their interactions with the two teachers-in-residence who, in addition to teaching courses, provided extensive on-site assistance in pedagogy. The teachers-in-residence each worked with four schools, visiting them each week to plan with teachers, to observe, and to discuss what had been observed. These meetings were often focused on a need that had been identified by the teacher. The period of time designated each day for professional development provided an opportunity for reflection with the teacher-in-residence. Also, the university mathematics instructors worked closely with the teachers-in-residence and frequently visited teachers in their classrooms and assisted them with the many problems inherent in teaching from new textbook materials to poorly prepared students, many with little understanding of English.

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In our analysis we use the construct of a teachers' professional community as defined by Secada & Adajian (1997). According to this definition, a *professional community* is a group of people with a shared purpose and a common base of technical knowledge. Its members are accountable to each other in achieving their goals and their practice is open to review in what is known as deprivatization of practice. Secada & Adajian further described what distinguishes *teachers'* professional community by operationalizing this construct along four dimensions: (1) shared sense of purpose, (2) co-ordinated effort to improve students' (mathematics) learning, (3) collaborative professional learning, and (4) collective control over important decisions affecting the mathematics program.

In this report, we focus on two of the eight schools participating in the first year of the mathematics reform initiative because they provide examples of the factors affecting the formation of teachers' professional communities. Our data corpus included field notes of the TnRs and researchers and informal interviews with teachers. It also includes the written reflections of the teachers as they responded to journal prompts and a survey. We documented changes in teachers' mathematical content knowledge as measured by pre- and post-intervention instruments and their self-reporting of confidence levels for various content areas.

THE CASE OF TWO ELEMENTARY SCHOOLS

We will call the two schools Harbor View and Palm. Harbor View had five mathematics teachers in this program, Palm had four. Both schools had a high percentage of second language students. At Harbor View 63.3% were English learners and at Palm 73.3% were English learners. However, Harbor View students were Spanish-speaking (62.5%) whereas the Palm students were more multi-lingual (only 44.5% were Spanish-speaking). Three of five mathematics teachers at Harbor View and two of the four Palm mathematics teachers had teaching credentials for teaching bilingual students. Mathematics teachers at Harbor View averaged 14.9 years of teaching experience; Palm teachers averaged 9.75 years teaching. Four of the five teachers at Harbor View and two of the four teachers at Palm had prior professional development. The professional development time given to these teachers was left for the teachers to structure, except when they were visited by university or school staff.

There were no significant differences in the two groups of teachers' reported confidence levels in teaching different content areas at the beginning of the school year. For the purposes of this discussion, we characterized teachers as weak, sufficient, or strong in mathematics content knowledge. Harbor View had two mathematically strong teachers and three were sufficiently strong in mathematics. Palm had two mathematically strong and two mathematically weak teachers.

We found that, according to Secada's & Adajian's (1997) description, the teachers at Harbor View aligned well along the four dimensions of a teachers' professional community while the teachers at Palm did not. The eight sites varied in the extent to

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which the teachers formed professional communities, with these two schools representing, to some extent, the extremes. We discuss them along each of the four dimensions.

Shared sense of purpose

Harbor View teachers developed a shared sense of purpose. Their reflections express a collective desire for their students to be prepared for later life. They discussed instilling children with the desire to learn and giving Latino children an opportunity in later-life situations. Their discussions revolved around what they could do as teachers to provide students with the opportunity to learn. At Palm, teachers espoused a goal of having the students understand mathematics. In their reflections, their stated goals are more diverse, such as getting the students to work independently and enabling students to solve problems in novel situations. They did not share common goals nor did they discuss how individual goals were to be met.

Co-ordinated effort to improve students' mathematical learning

The two sites differed in their use of time together. Harbor View teachers made a conscious effort to work together. They arranged their physical office space to facilitate their working together by arranging their desks to face one another in a large circle. The Palm teachers displayed no conscious effort to work together, and arranged their desks so that two of them faced a wall and two faced each other.

The TnR and the Harbor View teachers reported using their professional development time planning together prior to teaching and reporting on successes and failures of their previous classes and what modifications could be made for revisiting the topic. They also looked at and discussed videotapes of each others' teaching. As the year progressed they spent time looking ahead to prioritize topics with standardized tests and with the next year's curriculum in mind. The university mathematics instructor visiting the site reported that the teachers needed less assistance with mathematics content and spent their time discussing teaching mathematics.

In contrast, the teachers at Palm reported using their professional development time to report on successes and failures and learning content from each other or from the university mathematics instructors. They did not discuss teaching solutions to failed lessons. The TnR made several references in her field notes to her efforts to move the professional development time discussions during her visits beyond a discussion of what the students cannot or were not willing to do to what the teachers could change in their practice.

Collaborative professional learning

Collaborative professional learning describes how well and closely the teachers work together to learn about and improve their instructional practices *as related to mathematics*. Hargreaves (1994) distinguished between a collaborative culture and contrived congeniality. Collaborative culture is spontaneous, voluntary, development

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oriented, pervasive across space and time, and unpredictable. At Harbor View, teachers initiated discussions, informally in smaller groups, and sought opportunities to work together outside of the space of their professional development time to improve their instructional practice. The teachers observed one another's practice, both by visiting each other's classrooms and viewing videotapes with the videotaped teacher, and toward helping one another improve on teaching practices.

Contrived congeniality, as defined by Hargreaves, makes working together a matter of compulsion such as in mandatory peer coaching and when teachers are "persuaded to work together to implement the mandates of others". At Palm, teachers spent little time together except when mandated by the presence of on-site assistance. The discussions at Palm tended not to focus on planning but on sharing and reporting of experiences and on students' shortcomings. They did, however, report having helped each other learning mathematical content. Furthermore, the Palm teachers expressed a view that they were implementing district mandates and reported feeling that their "hands were tied".

Collective control over important decisions affecting the mathematics program

Harbor View teachers made grade-level decisions on content to be taught. They were willing to deviate from the adopted curriculum as needed to meet their shared goal of preparing underachieving students for their later life experiences, including students' success in school in subsequent years.

Palm teachers felt a lack of control over decisions affecting the mathematics program. The vice-principal and the principal both sought out the TnR on separate occasions to express concerns about the mathematics instruction being given to students, and particularly about students' need for direct instruction. The TnR was told that parents and classroom teachers requested that more homework be assigned. In a subsequent meeting with the TnR, the mathematics teachers expressed a desire to give more homework but frustration that they were limited by the "no adaptations, no supplementing" rule of the district mathematics office. Palm teachers predominantly adhered to the curriculum as given until one teacher made the decision to use materials from the same curriculum two grade levels below the grade level of the students she was teaching.

One mathematics teacher at Palm faced the problem of working in the classroom of a teacher who had classroom rules and procedures that were not aligned with those of the mathematics teacher. In October, the TnR and the mathematics teachers met with the classroom teacher and the principal to talk about ways to make the rules and procedures ones that both teachers would find suitable. They had some common ground but were unable to align them. There were constant problems with students--in February a mathematics teacher at Palm reported that a student had threatened to kill her. There was no action taken against this student though, by school district policy, the student should have been immediately suspended.

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In sum, Harbor View teachers articulate a shared sense of purpose, demonstrate a co-ordinated effort to improve students' mathematical learning, collaborate to improve their practices, and exercise collective control in decision making. Palm teachers could not.

DISCUSSION & CONCLUSIONS

The shared professional development time was intended to allow for co-operative planning amongst teachers at a site. Hargreaves (1994) described a three-year initiative intended to develop co-operative planning among school staff by providing additional preparation time. Yet, among the findings cited were that "...increased preparation time did not necessarily enhance the association, community, and collegiality among teachers. Time itself was not a sufficient condition for collegiality and community." (p. 131). So, why, under what could be identified as ideal conditions for the formation of communities that support teacher growth, did some groups of teachers form professional communities at their site and others not?

We identified several factors that seem to account for the differences in development and strength of teachers' professional communities at the school sites:

- the relationship the mathematics teachers had with the school administration and other classroom teachers,
- the respect for and access to the knowledge of other mathematics teachers,
- the presence or absence of a teacher leader,
- the mathematical content knowledge of the teachers and their reported comfort level when teaching mathematics, and
- the teachers' familiarity with the culture and language of the student body.

We discuss how these factors are related to the dimensions that distinguish teachers' professional community. One factor we identified as critical in the formation of teachers' professional communities was the nature of the relationship with the school administration and other classroom teachers within a school. In our eight schools, we saw a difference between the relationship between teachers and the administration at schools where the mathematics teachers were drawn from the site versus recruited from another site. Although these two school sites had all new staff, the Harbor View principal hired first, thus taking and being able to choose and select the best combination of teachers applying for the positions, whereas Palm teachers were selected last by their principal. Additionally, the shared professional development time was scheduled for the beginning of the day at Harbor View, reflecting the principal's commitment to the initiative and its success. The professional development time at Palm was shorter because of other responsibilities given to these teachers, and was scheduled for the end of their day. The Palm school administrator's questioning of the mathematics teachers' teaching and the classroom teachers' wanting to assign more mathematics work contributed to the lack of

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collective control Palm mathematics teachers had over important decisions related to the teaching of mathematics.

A second factor was the respect for and access to the knowledge of other mathematics specialists both at their sites and beyond. "Knowing what others know, what they can do, and how they contribute to an enterprise" is one of Wenger's (1997) indicators of a community of practice. A Harbor View teacher said, "I feel the strongest support [for change in my practice] came from the daily staff development we have at Harbor View. . .We have a level of trust to be able to discuss what went wrong and what could be done to correct a lesson." At Harbor View, each mathematics teacher has an area of expertise and others knew and respected and took advantage of the expertise of others. In contrast, Palm teachers did not share their expertise. Technology was also a factor in the quality of communication with those outside of school site. Harbor View teachers regularly used e-mail and the electronic bulletin board for the mathematics and pedagogy class. Palm teachers did not have access to e-mail and the Web. These constraints affected the degree of collaboration possible.

The presence or absence of a teacher leader was another key factor in the formation of a teaching professional community. The teacher leader can be a positive or a negative force and can play a fundamental role in shaping the shared sense of purpose. In this case, a Harbor View teacher with her experience with the California Mathematics Project led the co-ordinated effort to improve students' mathematical knowledge. No one stood out as a teacher leader at Palm.

The fourth factor we identified was the teachers' content knowledge and reported comfort level around teaching the content. This affected their collective control over decisions. Harbor View teachers felt empowered to alter the curriculum. Palm teachers did not feel that they could. Though two teachers at Palm were strong in mathematics content knowledge, two were quite weak. Their conversation around improving practice was limited by their mathematical understandings. This contributed to their feeling a lack of control over decisions affecting the mathematics program.

Last but not least, familiarity with the culture and language of the student body was a factor in two ways. In Palm's case, a multi-lingual environment and vast cultural differences in the student body affected teachers' co-ordinated efforts and shared sense of purpose, whereas Harbor View teachers shared a vision of empowering Latino children and were able to begin working together toward meeting their goals. Palm teachers struggled with classroom management issues late into the year. As documented in studies of beginning teachers, until issues of classroom management have been resolved a teacher feels as if he or she cannot move on to other considerations, such as design of instruction. Their image of 'self as a teacher' needed resolution before the focus could be turned outward (Kagan, 1992).

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Given our hypothesis that teachers' practice develops within community, we examined factors that seemed to affect the development and strength of teachers' professional communities at their sites. These factors were related to both the institutional setting and the individuals. As teachers participated in the larger professional community of mathematics specialists and the school communities, endeavouring to teach in new ways, their settings and changing identities co-contributed to the nature of the site-based professional communities.

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